What Is Claimed Is:

1. A method for determining the rotor position of a synchronous motor (2), comprising the following steps:
-   applying a plurality of current vectors (I) to the synchronous motor (2) in different directions, in so doing determining the amount of the current vector (I) necessary for attaining a defined deflection of the rotor (R);

-   calculating the rotor position from at least one angular position of the current vector (I), for which the amount of the current vector (I) necessary for attaining the defined deflection of the rotor (R) is minimal.

2. The method as recited in Claim 1, wherein a position-measuring instrument (3) is used for measuring the deflection of the rotor (R).

3. The method as recited in Claim 1 or 2, wherein the defined deflection of the rotor (R) is less than 0.01° for rotary synchronous motors (2) or less than 0.1 mm for linear synchronous motors (2).

4. The method as recited in one of the preceding claims, wherein the plurality of current vectors (I) is distributed uniformly over one electrical period.

5. The method as recited in Claim 4, wherein the plurality of current vectors (I) is distributed in steps of less than 10°.

6. The method as recited in one of the preceding claims, wherein the rotor position is calculated as the half of the sum of two adjacent angular positions of the current vectors (I), for which the amount of the current vector (I) necessary

for attaining the defined deflection of the rotor (R) is
minimal.

7.   The method as recited in one of the preceding claims,
wherein the direction of the defined deflection of the rotor
(R) is taken into account in such a way that the rotor
position is unequivocally determined.

8.   The method as recited in one of the preceding claims,
wherein as a first step, a brake (5) holding the rotor (R) of
the synchronous motor (2) is engaged.

9.   A control for a synchronous motor (2), set up for
implementing a method as recited in one of Claims 1-8.